POSTER:
State-of-the-Art Sea Ice Modeling

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Version 3.0 of CICE, the Los Alamos sea ice model, will be released later this year. The model incorporates a multiple-category thickness distribution and contains five main physical components: (1) an ice dynamics scheme for computing the velocity field, (2) a thermodynamic scheme for computing growth and melt rates, (3) a horizontal transport scheme, (4) a scheme for transporting ice in thickness space, and (5) a ridging scheme. The first four of these components have been upgraded substantially since the previous version. The elastic-viscous-plastic dynamics model has been modified to include metric terms; also, ice viscosities are updated during subcycling to give a better fit to the elliptical yield curve. The thermodynamic model now allows for an arbitrary number of ice layers with a temperature-dependent heat capacity in each layer. For horizontal transport we have replaced MPDATA with an incremental remapping scheme that preserves tracer monotonicity and is much more efficient for multiple thickness categories and tracers. For transport in thickness space we have developed a one-dimensional remapping method that is both accurate and numerically smooth. The model uses Fortran 90 modules and MPI parallelism. It can be run either in stand-alone mode or together with ocean and atmosphere models using the NCAR CCSM flux coupler. At 1-degree resolution, performance scales almost linearly as the number of SGI processors increases from 4 to 64. The CICE user community now includes more than twenty institutions in the United States and abroad.